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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
08/824,496	03/14/1997	J. CARL COOPER	JCC396A	8681

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EXAMINER
HARVEY, MINSUN OH

ART UNIT	PAPER NUMBER
2644	

DATE MAILED: 06/05/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.	Applicant(s)
08/824,496	COOPER
Examiner	**Art Unit**
Minsun Oh Harvey	2644

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *three* MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *Mar 11, 2002*

2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-53* is/are pending in the applica

4a) Of the above, claim(s) _____ is/are withdrawn from considera

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1-38 and 40-53* is/are rejected.

7) ☒ Claim(s) *39* is/are objected to.

8) ☐ Claims _____ are subject to restriction and/or election requirem

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) ☐ All b) ☐ Some* c) ☐ None of:

1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

*See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s). _____
4) ☐ Interview Summary (PTO-413) Paper No(s). _____
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

1. This case has been reviewed by the Supervisory Patent Examiner in response to a telephone call from Applicant.

Acknowledgment is made of the Appeal Brief filed 11-27-01. Prosecution was reopened in this case with the office action of 03/04/02.

Apparently Applicant did not understand that prosecution had been reopened in this case.

After extensive review and careful analysis, a number of references that are applicable have been found, and new grounds of rejection follow.

2. Claims 1 and 4-19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 1 and 19 requires that both delay and gain be automatically adjusted, whereas the parent claim requires that either delay or gain is human operator adjustable. Claims 1 and 19 therefore directly contradicts claim 1, making claims 19 and 1 indefinite.

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371© of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) do not apply to the examination of this application as the application being examined was not (1) filed on or after November 29, 2000, or (2) voluntarily published under 35 U.S.C. 122(b). Therefore, this application is examined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

4. Claims 2, 3, 4-7, 18, 19, 20-22, 23-27, 29, 20, 31, 37 are 38 are rejected under 35 U.S.C. 102(e) as being anticipated by Umemoto et al (referred to as "Umemoto" hereafter; note that the earlier filed PCT of this case was published on 8/4/94).

Claim 3 is exemplary for the basic components:

Talent signal (coming in on RS)

Feedback signal (via acoustic feedback path EC)

Variable Delay & Variable Gain is adaptive filter ADF (see Fig 3, each tap output represents a delay, the gain of which may be independent set)

ADF is automatically updated according to the error signal ESS,k which is equivalent to applicant's mix minus signal.

Combining circuit is junction 32.

The feedback signal is, of course, provided without a variable delay circuit.

For claims 4-7, 23-27, etc. note that the coefficients are updated according to ESS, but ESS = FeedbackSignal – ADFOutput. Consequently, it is true that both the delay(s) and gain(s) of the taps are a function of ESS (the mix minus signal), but the mix minus signal is just a function of (at least) the Feedback signal. Thus the delay(s) and gain(s) may be said to be functions of the Feedback signal. Hence the broad language of these claims is met.

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless -
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 2,3,4-7,10,11 and 16-18 are rejected under 35 U.S.C. 102(b) as being clearly by Agrawal et al ("Agrawal"), using a similar analysis to that used above.

In this reference, an explicit correlation using a correlator is disclosed.

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 8-17, 28 and 32-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Umemoto considered with the publication to Kuo et al (Active Noise Control Systems, pp 35-36).

As to claims 8-17, first, note that a correlator or use of a correlator is not recited, only the concept of a correlation between two signals.

Note that there is always inherently a correlation (be it positive, zero, or negative) between any two signals. As is well known in adaptive filtering, as mentioned by Kuo et al in their discussion of the Correlation LMS Algorithm, as the filter converges, the correlation between the error signal and the signal input to the filter decreases.

Thus in claim 8, for example, we already know that the delay and gain are adjusted according to the error signal ESS ("mix minus"); the magnitude of the error signal and its correlation are generally proportional, hence, the delay and gain at any iteration are determined (at least in part) by the correlation of filter input ("talent signal") and error signal ESS ("mix minus").

The inherent correlation being spoken of (this is distinct from the algorithm Kuo et al discuss, which is not itself being invoked in this discussion) at any instant exists between the feedback signal and the talent signal at any phase of the talent signal. There is an inherent correlation associated with the feedback signal and the undelayed talent signal, as well as between the feedback signal and the net filter output, which, of course, is a delayed version of the talent signal, and so forth.

If the relation or correlation of feedback signal and undelayed talent signal at any iteration is x, the correlation between the feedback signal and the filter output is fixed according to the current tap weights.

Thus if the error signal is responsive to the correlation between the feedback signal and the filter output, it is also inherently responsive to whatever the instantaneous correlation is between the feedback signal and the undelayed talent signal, taking the tap weights (and consequent delay introduced to the talent signal between the filter input and output) into account.

Hence the delay(s) and gain(s) are inherently responsive to the correlation between the feedback signal and the talent signal (RS in Umemoto) or a delayed version of it from the filter ADF.

Hence claims 8-17 are met. Note that the cancellation signal is the filter output (re claims 16, 17).

As to claim 20, it appears to be met by the foregoing discussion. The recitation "providing a cancellation signal of a known level in response to said delayed talent signal" is considered as met since the level of the filter output is known or knowable by its input and the instantaneous tap weight values.

Claim 21 is similar to the various preceding claims; note that "providing said mix minus signal in response to said feedback signal and said cancellation signal" is inherently met since the error signal ESS is the difference of the feedback signal and the filter output, which is the cancellation signal.

Claim 22 appears to be met in view of all of the preceding discussion.

Claims 23-38 also appear to be met. The word "comparison" in claim 38 is considered to be conceptually equivalent to "correlation", since correlation is just a type of comparison, and comparison is a type of correlation.

9. Claims 1,2,3,4-17,40,41 and 43-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tanno (JA 0170298) considered with Davidson and Kuo et al (Active Noise Control Systems, pp 35-36).

Regarding claim 1, JA 0170298 (Tanno) shows a simple acoustic echo canceler. A person speaking into M1 would, without D1 and T2, hear his voice in a feedback loop, as his voice would be aurally broadcast by speaker S1, picked up after a short acoustic delay in air by M2, and rebroadcast by speaker S2, to be picked up again by M1, and so on, creating echo and/or howlaround.

The limitations of claim 1 are read as follows:

person ("talent") speaks into mic M1;

cancellation circuit has delay D1 (variable), cancellation signal is the output of delay D!

feedback signal is the signal entering M2 which was broadcast by S1

combining circuit is T2

the result is a mix minus signal in the sense that the mixed signal is the sound from M2, which includes the user's voice at M2 plus background sound, plus the acoustic feedback of the voice from the user at M1, and the voice from the user at M1 is subtracted at T2 from the mixed signal.

Also, the feedback signal is "applied without the use of a variable delay circuit".

What Tanno does not show is that the delay D1 is user adjustable, and Tanno does not show a variable gain circuit.

In a similar field, interference cancellation, Davidson shows the use of manually adjustable delays to delay a signal sufficiently to allow it to cancel an acoustically delayed version of itself.

Since Tanno gives no guidance as to how the delays are adjusted, it would have been obvious to use any well known technique in the art, such as that of Davidson, which is manual or human operator adjustment.

Note that Davidson recognizes, by providing plural delays, that both direct and indirect paths may be taken, and thus plural delays are needed to model the acoustic path. Similarly, in Tanno, it would have been obvious to provide any number of manually adjustable delay paths for D1 and D2, as the particular use may require.

Regarding the need for variable gain, Tanno desires, for example, that The signal from M1 at point Q be canceled by the injection of a delayed version of itself at T2. One of ordinary skill would realize that in order for this to happen, the delayed signal from M1 via D1 must be subtracted from the signal from M2 (which would contain an acoustically delayed version of the signal from M1 which was broadcast by speaker S1).

If we designate the gain function from S1 to M2 as GS1-M2 , and whatever gain with which the output of D1 is injected into the T2 combining junction as GinjT2, and the signals from M1, etc., simply as M1, etc. (using the part name as the signal name for simplicity), we can write a simple expression for the signal at point Q, which we'll just call Q:

$$Q = (M1)(A1)(GS1\text{-}M2) - (M1)(GinjT2)$$

Note that this is true when D1 is properly adjusted so its delay and the acoustic path delay are the same.

Since we are only discussing the signal M, and we want Q to be zero for M1, we need to set Q = 0 in the above equation and solve for GinjT2), noting that in general, A1 is likely to be variable via a volume control, and that the acoustic transfer function is likely to be variable due to environmental changes.

GinjT2 = (A1)(GS1-M2)

Unless it can be guaranteed, and known ahead of time that A1 and GS1-M2 will always be constant (this is very unlikely to be the case), then clearly a variable gain adjustment must be provided for GinjT2

and it would have been obvious to do so in Tanno, such as by placing a potentiometer at the output of D1, if D1 is a single delay, or multiple potentiometers if D1 is implemented according to Davidson with plural delays to account for plural acoustic paths (both direct and different echo or indirect paths).

The Tanno, Davidson, Kuo combination thus far described meets claims 1, 40, 43, and 46; as to claim 41, it would have been obvious for an operator using the combination to adjust the device in any manner desired, such as to fully attenuate the echo, or only partially, if even only to hear what partial echo cancellation sounds like, even if only once.

As to claim 44, since the operator listens to the result which is essentially the error signal for M1 at point Q (its emitted by S2), and would adjust delay and gain in response thereto, it certainly would be true that "the amount of said gain responsive to said mix minus signal..."

As to claims 45 and 47, they are treated as 41.

Continuing the discussion with claims 2, which is an independent claim; it requires that the delay and/or gain be responsive to said mix minus signal, etc. This limitation is met for the same reasons as discussed with respect to claim 44.

Claims 4-17/1 are rejected using reasoning similar to that given in the rejection supra using Umemoto and Kuo et al.

10. Claims 18, 42 and 48-53 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Tanno, Davidson, Kuo combination as given above, further considered with either of Agrawal et al ("Agrawal") or Umemoto et al ("Umemoto") or alternately, either of Agrawal et al ("Agrawal") or Umemoto et al ("Umemoto") considered with Davidson..

While the Tanno, Davidson, Kuo combination is a primitive working embodiment, manually adjustable, and no doubt suitable for certain situations without rapidly changing conditions, it would have been obvious to provide an alternate automatic coefficient update mechanism which could be switched in when the user desired to have automatic delay. Such a combination would then have both human adjustable and automatically adjustable delay and gain.

Such a combination is in fact, merely an arrangement to alternately switch between known (i.e., unpatentable) combinations with no new or unexpected result. See Duplan Corp. v. Deering Milliken, 197 USPQ 342 (#97).

A similar line or reasoning applies to the alternate rejection, in which the fully automatically updated adaptive filter reference would be provided with an alternative, manually operated arrangement. Besides the reasoning of Duplan Corp, provision of manual override controls in any (automatically) adaptive system for purposes of manual control when the coefficient update algorithm misbehaves (i.e., coefficients diverge, such as when a too-sinusoidal signal is in the channel, with insufficient noise).

Either of these combinations would read on claim 42, for example, when the operator sets the delay and/or gain in manual mode, and then decides to summarily switch to automatic mode. Presumably, the adaptive filter, automatically operated, would converge (within 10 times the filter length) rapidly to "the expected amount", as recited in claim 42. Claim 48-50, 52, and 53 read similarly. Note that these claims do not recite –automatically initiating the change of operational mode from manual to automatic". They only recite that a value which had been set manually is (ostensibly) later change by an automatic process, which reads on an LMS adaptive filter converging, the manner of initiation or switching from manual to automatic mode not being limited by the claims.

Claim 51 is also considered obvious for the same reasons as claim 45, for example.

11. Claim 39 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Any inquiry concerning this communication or earlier communication from the examiner should be directed to **Minsun Oh Harvey** whose telephone number is **(703) 308-6741.**

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Bill Isen**, can be reached at **(703) 305-4386.**

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

Or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal Drive, Arlington, VA, Sixth Floor (Receptionist)

Any inquiry of general nature or relating to the status of this application or proceeding should be directed to the Technology Center 2600 Customer Service Office whose telephone number is (703) 306-0377.

MINSUN OH HARVEY
PRIMARY EXAMINER